

COST *and* MANAGEMENT

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The Use of Costs for Better Management Practice

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(Before the Montreal Chapter, March 25, 1927.)

THE invitation to give this talk reached me while I was in the midst of a field trip. I thought there would be no better way to present the subject than to gather actual instances as I passed from plant to plant. Since that time, I have covered not a little territory.

What follows will be made up principally of illustrations of the actual use of costs for better practices in a wide field of industry.

Cost accounting as practiced to-day is gradually developing into a field of usefulness hitherto little realized. Formerly costs were obtained almost entirely out of necessity as a means of closing the books. Even to-day elaborate and costly systems are in effect for this sole purpose, where collective costs would better serve their purpose.

A cost system to be of value must serve as a dependable guide to the executives in the administration of manufacturing operations. Many firms to-day have prepared current reports that reveal to the executives variations between actual and standard performance pointing the way to economies and increased output.

With the facts at hand in an easily assimilated form, usually current with the operations concerned, the executives are provided with a definite basis for action.

To quote the executive of one plant: "We use costs for the following reasons:—1. For purposes of control. 2. For purposes of obtaining profit and loss. Of the two, the first is vastly more important and is considered by our staff as a means to determine the efficacy of the organization. For the purpose of control it is very essential to have the management supplied with comparative production costs to-

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gether with all other operating expenses comprising the three divisions of administration, production and selling."

Modern shops are divided into departments and if the line-up takes this into consideration as it should, the works manager, the superintendent, and the foremen will have periodic comparisons for study. They will readily detect excess charges or fluctuations which when investigated permit of the most interesting revelations in regard to the entire management field.

A ventilating engineer will tell you that the principle to use in combating obnoxious gases and fumes is to remove them at, or as near as possible, the source. Perhaps the source of most opportunities for bettering practice lies within the scope of the foreman. What is being done to assure that this key to the situation is receiving, understanding, and interpreting the facts presented in the cost data?

The Place of the Foreman

All are not agreed upon what facts or figures should be given to the foreman. However, there is more or less agreement on the giving of information to the foreman on the results of his operations. Some state that the foreman should be given all facts; others state that he should have only those controllable factors entering into his work. One manufacturer states that an industry will benefit by having the foreman know the cost of everything for which he is responsible, particularly of indirect items, such as, maintenance and repair, miscellaneous supplies, etc.

In what follows, I will give an outline of the place of the foreman in the organization of the Crompton-Knowles Loom Works, as described by Mr. Tinsley, Vice-President and General Manager of that company.

"The foreman is in our present scheme of industrial management of the most vital consequence. Have we done as much as possible in educating the foreman thoroughly as to his place in management? I think in entirely too many concerns, the foreman is nothing but a 'gang boss.' Overhead to him is a vague, indefinite thing that is associated with clerks and main office expenses. His idea of reducing overhead is to discharge the clerks in the main office and possibly the officials. He does not realize that, after all, his own handling of the problems of his department has much to do with overhead.

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"In an effort to meet what I consider a serious need in this field we instituted a new departure in the handling of foremen at the Loom Works in the past two years.

"We have impressed upon the foremen that in a large plant they are the 'little managers'—and that if each foreman makes his portion of the business successful, then must the business as a whole be successful.

"To the end of making this application as concrete as possible, we have figured out for each one his portion of the business, so to speak. Based on floor space occupied, we pro-rate to each foreman the value of plant, machinery, tools and equipment, and this with the direct labor and shop overhead, makes up their year's business. Thus, we bring to each one a definite conception of the financial responsibility that is in his keeping as a foreman. It is surprising what a different appreciation a foreman has of his job when he knows the money value represented by it. We have a large number of foremen whose annual business volume, figured as just described, runs from \$100,000 upwards per year.

"This method of financially rating each job naturally gives an unusually favorable opportunity for educating the foremen as to the problems of business management, including a knowledge of costs and simple cost finding, overhead, labor turnover, the importance of quality, the using of equipment and the planning of operating schedules so as to give the maximum of efficient service and the best costs.

"Under such a plan the instruction given is interesting and concrete because such important matters are discussed in terms of application to the foreman's own job.

"Our results over the past two or three years have been very gratifying.

"We have found another great advantage of this method in that it provides a basis for rating our foremen on performance. Foremen require for the best accomplishments, the same as all other classes, incentive and reward. The disadvantage of a large business is frequently reflected in a foreman's attitude. He is apt to think, that no matter how good his work, he will not get full credit for it, at least he has a feeling that management is so remote from him that it does not know what he is doing. This method of ours does away with all of this because once or twice a year

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we have a summarized report presented to the General Manager covering each job; based on this report, increases in foremen's compensation are decided upon, and the foreman's capabilities for further responsibility and promotion determined upon in great measure. A copy of this report on each department is also given the foreman of that section, and the various features of it are gone over with him by the General Manager and Superintendent and the committee that prepared it. Under each sub-head of the various classifications he is rated as his performance merits—either excellent, good, or subnormal. His meritorious records are emphasized and commended, the subnormal performance pointed out equally clearly, and a special effort is made to feature the lessons to be learned.

"The importance of this particular phase of our efforts cannot be over-emphasized. A good foreman wants to have the management know his record and is willing to stand or fall on it. We have found it quite simple, with our existing records to rate our foremen thus on performance. We have emphasized to our foremen, that, after all, they are the key men in the handling of the four great problems of management, namely, maintaining quality of product, getting out production, handling men, and making manufacturing costs.

"In connection with quality, we rate our foremen, (a) on the number of customers' complaints that we receive on their work, (b) on the number of complaints made by our own shop inspectors on their work before it is sent out, (c) on the amount of scrap produced through spoiled or defective work.

"In regard to production, our bases for judging the foremen are, (a) on the job earnings of the men, (b) on the machine efficiency reports, (c) the various schedules and promises on production.

"In regard to handling men, we take, (a) the department's turnover record, (b) the accident record, (c) the attendance record, (d) the discipline record.

"In regard to costs, the comparison is made of (a) departmental value, (b) overhead, (c) savings in direct labor, (d) machinery repairs, (e) small tools expense, etc.

"A comprehensive review each year of performance in these various groups, with comparison of the previous

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year's results, makes moreover a splendid summary that enables the foreman to see himself in perspective, so to speak, and to concentrate his future efforts in correcting his weak points.

"Relative to training in departmental costs and production methods, our foremen are given intensive instruction by experts from our Cost Investigation Department and our Production Methods Department. In this instruction generalizations do not predominate. Costs and manufacturing methods affecting a foreman's department are covered with the foreman in the terms of that particular department. As a result, our foremen have developed a splendid knowledge of costs and how they are built up and they follow their own costs very zealously."

This plant has an excellent foundation on which to build. I would like to stress the idea of the foreman as a "little manager" on a sound basis. He knows what it is all about and how to use the results demonstrated for bettering conditions.

Illustrations From Actual Practice

A few illustrations of actual applications and investigations of facts shown by costs will perhaps give a better picture of possibilities.

"We have a production problem," said a manufacturer of false teeth. "We have moved into a new plant and it is costing us more to produce teeth here than in the old plant." The increase had occurred for the most part in the molding department. Teeth are molded in brass molds. A unit of five operators perform the operations incident to a completely molded set of teeth. A study of piece rate earnings showed a wide variation among the several teams.

The end operator of each group was the team captain and supervised operations. The team which attained the lowest cost and best quality in output had a very able team captain. She had insisted on each operator performing the same series of operations as molds passed her. At other units an operator was prone to alternate with resultant loss of learning benefits. This investigation resulted in a uniform training of operators and a standard method of molding. By these changes it was possible to increase the production per unit approximately 60%, obviously decreasing the cost.

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Machine Tool Manufacture

An illustration of how far a little thing may carry one is given in the following: This plant manufactured lathes and from a comparatively small beginning had reached the position of sixth in the field of manufacture in the United States. Criticism of assembly costs started the ball rolling. The foreman countered with the statement that there was too heavy a charge for material handling. In fact he was obliged to use productive labor to supplement his move men. Particularly was this so in the preparation of lathe beds. He suggested a better grouping of equipment. The management said: "You are crowded already; to give you more room, a plant extension will be required." However, the management finally decided to study the plant layout. A new layout showed that there was adequate space to take care of present needs of the plant and growth for some years to come. Over a comparatively short period with the new layout this company is showing a 15% reduction in the cost of their finished product. The execution of the layout had brought to light a number of skeletons, and has prompted the development of a production control system for tightening control. All the results of this foreman's discussion have not yet been reached.

We are all prone to say that certain operations could be bettered or that existing conditions are poor but unless we get the facts and figures our comments are usually passed over.

A Hosiery Mill

The following instances demonstrated where analyses of costs assisted materially in bettering practices in a hosiery mill. Up to the time of this investigation all of the styles were sent through the same departmental routine from knitting through inspection, that is, they went first through the hemming department, then mending department, then inspection and a certain piece work rate per dozen was paid for each style in each department. As a result of the investigation the knitters were directed to segregate their work into two special classes; the first class being perfect goods, and the second class goods containing defects. This second class mounted to approximately 10% of the total production and every stocking contained a defect, some of them slight. All of the goods were then sent

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to the hemmers and were hemmed and instead of the total production going to the menders for mending, only defects were sent to the menders and thereby the piece work rate in the mending operation was saved on approximately 90% of the production. This 90% the menders did not get; they were sent direct from the hemmers to inspectors and any defects that were then found were sent to the menders for repairs. This percentage, however, was very small. As a result of this study there was quite a little saving in labor costs. In place of paying on a basis of about eight cents a dozen for mending 100% of the production, payment was on the basis of seventeen cents per dozen for mending approximately 15% of the total production.

Another instance had to do with material. As you know carded yarns are cheaper than combed. The assumption had always been that yarn that cost the least amount per pound would cost the least in finished product. This plant worked under this assumption for several years. As a result of the cost investigation it was found that due to the particular way in which their needle beds are formed carded yarns made a great deal more waste and seconds than combed yarn did. A specific style was taken in which the production was quite large. It was found that in knitting one thousand dozen from combed yarns and one thousand dozen from carded yarns that the combed yarn was very much cheaper because of the fact that the machines ran better and seconds were very greatly reduced. As a result of this study it has been determined to use combed yarn in all products manufactured in this plant. In addition to the production savings made this is given the Sales Department for sales argument as a combed yarn stocking is being furnished in competition with the cheaper carded number. Of course, a combed cotton stocking has a better finish and a higher grade than one made of carded yarn.

The executives of another hosiery mill felt that they could economize greatly by buying as low grade of wool as possible and by proper blending work this material into their production. Perhaps if some of you have attempted to use china wool for hosiery you have had a similar experience. While the first price was low, it was pointed out that the defective material and the extra labor required in making up stockings of this low grade material would more than compensate for the savings they made in purchasing

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low grade wool. An investigation in the knitting room showed a large percentage of defective material caused by breakage in the yarn. In the carding department considerable trouble was experienced with the yarn. The winding room had great difficulty with breakage. This illustrated a good compilation system.

Cost of Issuing Orders

One company investigated the cost of issuing orders through its purchasing department. It was found that it cost two dollars to send an order through this department. On the basis of this experience practice was changed so that all small items costing under five dollars were to be bought outright for cash. It was observed in all cases that the small savings by purchasing through regular channels was much more than consumed in the cost of making out and issuing the individual orders.

An Underwear Manufacturer

In the finishing room of this plant the practice had been to inspect work after the labels had been sewed on and return the defective garments to the operator responsible for the defect. As operators were on piece rate basis and were putting through garments in large quantities this meant a constant hold-up due to interruptions. In addition to disturbing the operators it resulted in broken lots being held on the floor before checking. This ran up the amount of goods in process at any given time, and to the observer pointed to a bottle neck in the production flow. As a result of a study of this situation it was determined to set up a repair department. This was manned by four operators and at the present time takes care of all defective goods coming through. Operators are charged at the rate of one cent a garment for defective garments. All of the defective work is handled by this department. This has resulted in an increased production per operator and in addition has meant the quick moving of lots through the plant.

Conveyor System for Packing of Underwear

A plant shipping normally three thousand dozen garments a day had built up a considerable packing room to handle this quantity. It was thought that the installation of a conveyor system might expedite this work. The investigation of the conveyor system pointed out a number of

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factors which would help expedite packing of the goods. It was found that in place of pasting labels on the boxes that the labels could be printed directly on the boxes by a special printing machine. Some of the operations formerly carried on in packing were eliminated as it was found they were a matter of tradition and not particularly needed. The conveyor system was found to be advisable and its installation more than proved the expectations of the superintendent for the packing force was considerably reduced as a result of the system installed.

A Shoe Manufacturer

This company manufactures a high quality shoe. Its orders are made up of regular case lots, rush orders and single pairs. This last item runs into a considerable quantity. A cost investigation demonstrated that the indiscriminate sending of orders marked "rush" and single pairs, resulted in a considerable strain on the factory. In fact, it was demonstrated that certain styles of shoes when sent in as "rush" or "special handling" resulted in a material drop in the production of the factory. A study of the demands on the plant showed that it would be possible in most cases to plan the orders sent into the plant so as to get a comparatively even load and thus keep down the excess charges due to running large quantities of single pair or rush lots. It was found that on Monday morning there were a large number of single pairs. To send these into production as received meant a heavy load on the cutting and stitching departments as each pair of shoes demanded individual handling. By setting up a budget figure showing quantity which could be sent in each day, it was possible to distribute this load over the week and thus distribute the load with a corresponding increase in the output.

A Plant Manufacturing Ball Bearings

The object in this plant was to facilitate production by supplying current records of the efficiency of each operator. By the middle of the next day following the actual performance of the work the efficiency of each man is posted and the results of inspection given. The Time Study Department in this plant is engaged in a constant study of equipment to check what equipment is no longer economical to maintain and by doing away with such equipment facilitate production.

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An Oak Wood Flooring Manufacturer

An analysis of costs in this plant showed that the item of waste remained fairly constant and relatively high. Management was anxious to eliminate this waste wherever possible. As the best way to secure facts is to obtain them at their source, a study was made of the points at which waste occurred. It was found that the principal difficulty in this plant was the practice of passing products through several operations when it might easily be observed early in the process that the finished product would be discarded due to defects. Lumber was sent through the rip-saw and then directly into the molding machine. As this machine was the bottle-neck of the plant it was desirable to reduce the load on it to a minimum. This was not being done when all the lumber coming from the rip-saw was sent directly into the machine. It was decided to place a cross-cut saw between the rip-saw and the molder and take out defects which were plainly seen. This change resulted in a considerable reduction in the load on the molder and an increase in the output of good material by the plant.

Use of Costs in Foundries

A few years ago we made a study of management practices in the foundry industry—particularly the grey iron foundries. An outstanding observation was the weakness in the cost end. This resulted in the usual cut-throat practices causing heavy casualties in failures in the industry.

As far back as 1908 the American Foundrymen's Association through its cost committee attempted to arrive at some uniform basis for arriving at foundry costs. While there has been some response to these efforts this branch of the industry has no recognized uniform basis for arriving at costs. And this results from a number of causes.

Some progressive firms recognizing the need of placing competition on a sound basis have formed local associations or have converted local associations into groups working on the same method of figuring costs. I am familiar with four such associations. Membership varies from five to fifty. Usual procedure has been to engage an accountant versed in foundry practice with a knowledge of what is wanted in the way of costs and ability to arrive at that point with a

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minimum of effort. Perhaps multiplicity of records and compilations have caused difficulty in previous endeavors for successful groups to-day secure real dividends of service from very simple records.

As an illustration, one group in the Middle West comprising eight plants had installed a uniform system. Each month analytical reports were submitted to the cost consultant. These were compiled and set up on a comparative basis against a blind designation of the foundries concerned. Foundries with similar production were grouped as well as possible to show comparative performance.

The line-up of the monthly summary was as follows:—

MELT COST

Labor Power Expense Supplies	6% Int.	Coke	Pig and Metal	Total Melt Cost
.0032	.0012	.0022	.0122	.0188

MOLD COST

		Expense		Total Mold Cost Inc. Prod. Labor and Exp. per lb.
Prod. Labor Cost per lb.	Cost per lb.	Cost per Floor	% to Mold Prod. Labor	
.0072	.0104	.1007	110%	.0186

CLEAN & SHIP

Cost per lb.	Cost per Floor	% to Mold Prod. Labor	Total of Clean and Ship and Mold Ex- pense to Mold Prod. Labor
.0064	6.18	88.2%	198%

CORE COST

		Core Expense	Total Core Cost In- cludes Prod. Labor and Exp. per lb.
Prod. Labor	Cost per lb.	% to Core Produc- tion Labor	
.0032	.0061	193	.0093

TOTAL COST

Mold and Core Prod. Labor	Pig Metal and Coke per lb.	Expense Cost per lb.	All Expense % to all Prod. Labor
.0104	.0144	.0272	261%
TOTAL COST .0520			

Perhaps this is not the best system obtainable, but it is a real effort in the right direction—namely, education in the value of costs.

Each member of the group has his individual summaries, which are sub-divided further. There have been some excellent results from this work. One plant I recall found its melt cost running out of line with others. It was traced back to the labor cost in the loading of the cupola. Improvement in methods involved a concrete runway in the

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yard, making up of unit charges in the yard, in place of promiscuous dumping on the charging floor, use of tipples for transport of coke.

Use of Cost Analyses on Items Not Usually Considered

Under the title "Indirect Expenses" are usually grouped such items as insurance, rent, taxes, maintenance and repairs, power, freight and cartage, along with several others depending upon the individual plant. In some cases the figures showing the cost of these various items are taken more or less for granted and stress laid particularly on the more direct factors influencing cost of manufacture. There are many instances of companies who have looked within these items and from them have brought to light many possible improvements which have resulted in reduced costs.

Location of Plant

Among the items mentioned above, taxes, freight and power are directly concerned with the location of the particular plant or industry. Is the present location expensive, or could the plant be more advantageously located in another community or site? The answer to this will be found as a result of laying the facts on the table through accurate cost analyses. These costs generally comprise power, fuel, transportation, labor, taxes, and water supply. Where the item of cheap labor is the life blood of one industry, it may mean practically nothing to a different type of industry.

The following is an example of a cost study made covering the advantages of the City of Louisville, Kentucky, as a location for an iron foundry at present situated north of this point.

First is the consideration of raw material. Pig iron can be assembled to advantage in Louisville from both the southern and northern fields at greatly reduced freight rates. It was found that in having the pig iron shipped in by water and subsequently transferred from the barge to cars for placement at the plant, were the plant located on a particular railroad, the saving in switchage charges alone would amount to 37.6c per gross ton on a carload of twenty-five gross tons over the cost of placing the car if the plant were located on another railroad. Scrap was available at costs below average in the surrounding country.

Coke placed in Louisville averaged thirty-two cents a ton higher than in the other community. This was more than

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offset by sand costs. Sands, molding, core, abrasive, and limestone may be obtained either locally or at short range at favorable prices. Pig iron could be laid down at plant in Louisville at about \$1.25 per gross ton less than in the other city because of the former's low water rates. It was further developed that in ten years in Louisville the foundry in question would save \$18,125.78 in taxes. Louisville exempts new industries from all city taxes for five years while the State laws exempt all manufacturers from city and county taxes on machinery, raw materials and material in process. The power, fuel, and water costs were also analyzed and comparisons made, which resulted favorably for Louisville. In the case of this particular plant's labor requirements, the manufacturer supplied a list of the various classes of labor employed at his existing plant. A local wage scale was accordingly developed covering the respective occupations listed and forwarded to the manufacturer for his analysis. It was found that Louisville's wages as a whole were 15 $\frac{7}{8}$ % lower. This was due in a great measure to Louisville's low cost of living.

In comparing Louisville's costs with those of the other city, a system of weights was adopted, that is, the item of pig iron was assigned a certain percentage weight, that of sand another weight, etc., the total being 100%. Louisville's weights aggregated 94.3%, while those of the other location totalled 69.8%. In dollars and cents the difference between these two percentages represented a saving amounting to \$73,562.12 annually.

Cost Accounting With Respect to Accident Experience

An item, and in many cases a growing item, entering into the cost of production or operation, is that resulting from the expense incident to accidents. This may be confined to the so-called industrial accident or it may include the new very prevalent street accidents which involve the trucking end of the business and frequently cause large expenditure for the settlement of lawsuits. Such charges materially affect trucking costs.

The effect which accident costs have upon a business is of growing importance because of the tendency to increase the liberality of compensation laws and because of the awarding of greater judgments in civil suits.

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It may be perfectly natural for the cost accountant, particularly in organizations carrying compensation and liability insurance, to pass over this item with the feeling that the insurance premium is a non-preventable tax, chargeable to overhead. Furthermore, there is the impression that the insurer need pay little attention to claim costs as these will be taken care of entirely by the insurance carrier once the annual premium has been paid.

Where an employer is a self-insurer greater attention is naturally given to this item of expense because each succeeding accident becomes an additional direct charge on the business. Even in such cases, this cost may be buried in overhead, without full appreciation of the fact that it is in reality a definite portion of the costs of producing a certain commodity or of conducting a certain business. The control of this expense, like the control of other operating expenses, is dependent on its analysis and an accurate knowledge of its cause and relationship to the business as a whole or to its component parts. With the use of schedule and experience rating plans now practiced by compensation insurance carriers and those writing fleet automobile liability insurance, this analysis and knowledge become of importance to the employer carrying such insurance as well as to the self-insurer.

Such an analysis may be developed in several ways. The American Car and Foundry Company, a self-insurer, operates each of its plants on a daily budget plan. The liability payments are charged to each plant as an individual portion of their overhead account. Thus the management of each plant has before it daily the cost of accidents related to operating costs. In 1923 this company found that it was paying four cents per man hour worked for liability settlements. In 1924 this figure dropped to three cents and in 1925 to two cents. This fifty per cent. reduction in two years was undoubtedly due, in large part, to the definite interest of the plant management, instilled by its intimate knowledge of costs.

A year ago an effort was started to reduce personal injuries among the longshoremen employed by the Southern Pacific Steamship Company, an organization carrying its liability through an insurance carrier. As an initial step, an analysis was made of the previous accident experience as related to the most important commodities handled. This

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was prepared on a lost time accident basis. From a management standpoint, however, it would have been preferable to have prepared it on an actual cost basis, as it would have indicated the accident expense incident to the handling of each type of commodity. As it was, the analysis quickly showed the need of greater care in the handling of certain commodities, chiefly copper bars, railroad ties and iron and steel shapes. It centred the attention of the management and supervisory officials on the various commodities in their relative accident producing standing. The application of this definite information was an important aid to the safety work which resulted in a seventy thousand dollar reduction in claim expenditures in one year, an improvement which will affect a material reduction in insurance premiums. A careful analysis of costs developed the further fact that as the safety work progressed from month to month there was an increasing reduction in the cost per ton of handling freight.

Several department stores in New York City were brought face to face with this factor. They were insured by one agency which was giving weighty consideration to making a decision whether to carry on these risks or not as the experience had been very unfavorable. They convinced the managements of the department stores that it would be advisable to make a safety study in an attempt to determine what accidents were costing the majority of the claims paid and if possible, cut down or eliminate these costs. Accordingly, a safety campaign was organized under a safety consultant. I have the results of the campaign in a store employing nine thousand workers. The campaign started November 1, 1926, and during November and December the total cost of all accidents was reduced 60%; the cost of compensable accidents among the nine thousand employees was reduced 70%; the cost of accidents to customers was reduced 72%. Fifty-five operators of elevators carried three million passengers during the two months without a single accident. The results obtained here speak for themselves.

Many more examples might be cited but these will probably suffice to indicate the definite part which an accurate analysis of accident cost figures and the allocation of these figures will play in any effort to reduce this important item of expense.

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Machine Tool Manufacturer

A machine tool manufacturer describes as the practical and dividend paying use of cost the following summaries through which performance is presented in his plant:—

- a. Comparison of present production costs with previous costs.
- b. Comparison of all standing expenses orders by months throughout the year.
- c. Departmental expense by months.
- d. Comparison of all administration expense monthly.
- e. Comparison of all selling expense monthly.

Form A is used for cost comparisons and shows the actual cost of every order for Part HM8-1 since January 1, 1923. Any considerable fluctuation in these costs is reported to the proper authorities, who check up on the cause.

Form B—Charges to Repairs to Tools, Jigs and Fixtures, is an actual record by departments showing the charges for the year by months—E28 is the standing order for this work and is used in all departments alike. This gives a very concise report and demonstrates how easily fluctuations of any extent may be watched. You all have experienced the prevalence with which employees who knowing their time on productive jobs is checked up to divert any excess time to the standing expense order provided for repairs to shop tools, but when charges to repairs are checked a switch is difficult.

Form C—This particular form is used for departmental expense. This for tool department. It shows all expenses compared by months and also the relation to productive labor.

The other sub-divisions are equally important but may be easily obtained, usually from a general ledger.

Labor Control and Its Possibilities

During the past week the Assistant to the President of a company manufacturing electric cables remarked: "It is not necessary with our control methods to know anything about the details of manufacture in this business. In fact, there are a number of our products which I have never seen and yet we have absolute control over their manufacture."

This company has two plants located in adjacent cities. A year and a half ago work was started on the installation

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A DESCRIPTION—INDEX WORM GEAR (DOUBLE THD.), PART NO. HM 8-1

Order										Order									
Month Finished	No.	H	Pieces		Actual Cost	Stock Value	Av. Stock Value	Month Finished	No.	H	Pieces		Actual Cost	Stock Value	Av. Stock Value				
			Good	Bad							Good	Bad							
1922								1925											
12	1394	13	7		9.11	8.50	8.23	6	6066	15				7.26					
1	1790	15	14		9.29	8.23		9	6678	15				7.46					
2	238	13	2		8.48	7.61		9	6904	15				6.98	7.32				
4	2303	14	1			7.52		1926											
6	2576	20				7.42		2	7939	15				7.34					
7	2653	15				7.75		8	9431	6				7.46	7.37				
7	2829	19	1		7.61	7.28			1736										
10	2934	20				7.07	7.64												
1924																			
9	4938	14	1		8.14	7.64													
9	5030	15				7.17	7.48												
1925																			
3	5485	15				7.45													
5	5991	15				7.32													

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B COMPARATIVE STATEMENT OF STANDING EXPENSE ORDERS—YEAR 1926

No.	Dept.	Jan. 4 Wks.	Feb. 4 Wks.	March 5 Wks.	April 4 Wks.	May 4 Wks.	June 5 Wks.	July 4 Wks.	August 4 Wks.	Sept. 5 Wks.	Oct. 4 Wks.	Nov. 4 Wks.	Dec. 5 Wks.
E 28-100	C & R to												
101	T. J. & F.	381.36	349.81	451.76	481.77	363.63	458.20	322.16	310.84	405.31	345.95	226.17	335.56
102		6.13	.64	1.36	.93	6.34	13.47	9.47	.46	.90	.99	3.59	
103		67.38	46.16	37.51	26.19	41.51	33.42	35.66	45.67	32.15	21.67	20.11	32.84
203		3.47	18.66				4.33	3.87		.53			.64
104													
105		6.66	5.69	12.70	19.71	13.33	14.00	9.59	49.62	39.34	41.39	31.74	42.41
106		.15		2.04	1.33						5.65		
107		4.40	6.48	8.82	7.59	6.87	10.42	5.59	6.77	4.69	11.72	8.73	6.53
108		6.25	11.15	19.95	23.53	5.55	1.79	10.78	4.43	17.71	2.57	6.61	22.13
109													
110		109.30	78.71	231.95	142.02	229.07	130.39	234.58	165.82	143.60	164.92	118.69	248.12
111		180.66	188.25	364.94	259.10	208.81	219.10	190.81	225.09	191.96	254.51	241.63	215.15
112		205.73	360.88	309.63	263.98	136.52	176.67	150.30	192.26	150.01	151.52	193.21	259.47
114		109.18	97.37	188.42	158.75	85.92	128.35	101.06	125.76	156.87	112.89	75.09	181.20
115		337.62	334.73	311.19	607.29	755.37	1111.86	846.19	729.48	1008.02	802.63	535.96	258.79
120		164.17	134.22	203.07	142.47	102.24	107.00	154.39	184.89	270.75	253.45	304.96	270.21
122		368.00	310.04	402.28	220.25	307.51	363.25	286.71	271.70	356.40	326.74	229.04	138.03
123		403.40	193.06	187.33	356.83	153.97	137.82	71.71	188.61	102.40	128.35	81.82	159.76
124		236.27	262.53	383.58	292.10	305.45	342.73	359.10	436.77	353.42	295.93	255.52	246.87
126		274.82	210.59	240.94	183.46	162.85	306.72	225.79	218.15	254.70	289.74	294.33	316.64
128		1148.81	1102.18	1157.48	523.82	592.53	544.79	452.19	597.22	508.13	601.84	454.37	509.52
129		21.91	20.61	34.68	38.98	31.92	24.64	7.56	24.71	26.28	45.06	27.57	39.30
135		294.92	194.57	514.95	148.98	332.33	167.78	162.48	154.62	123.30	78.48	185.12	78.48
140		22.48	32.14	96.53	50.79	82.35	72.56	11.51	51.51	96.50	57.51	34.20	49.87
141		280.37	373.92	339.97	83.45	53.12	71.98	148.46	58.60	71.22	82.94	34.53	76.84
GENERAL													1.87
312							.22				15.90	.24	

COST AND MANAGEMENT

DEPARTMENT 101

	January	February	March	Total 3 Months	April	May	June	Total 6 Months
Shop Productive Labor	598,268	802,371	982,581	2,593,220	772,634	812,722	919,982	9,099,558
DIRECT EXPENSE								
1 Salaries—Foreman	50,400	50,400	63,000	163,800	50,400	50,400	63,000	327,500
2 Salaries—Clerks & Non-Prod.	31,613	37,626	49,967	126,206	39,053	37,986	48,497	251,742
3 Vacations	876	3,528	3,860	8,264	3,716	2,692	2,927	5,619
4 Belting	20,023	18,057	17,963	56,043	21,793	3,699	2,981	15,660
5 Chgs. & Reprs. to Machinery	49,932	47,717	47,469	144,858	58,668	22,045	16,013	115,894
6 Chgs. & Reprs. to Shop Fix.	28,111	28,111	28,111	84,333	52,753	62,107	54,578	369,909
7 Chgs. & Reprs. to Machinery	43,398	53,387	52,905	154,690	52,753	55,575	55,575	318,593
8 Depreciation on Shop Fix.	3,183	3,267	3,887	10,331	3,859	4,223	4,223	22,644
9 Depreciation on T. J. & F.	1,940	1,940	1,945	5,825	1,981	1,981	1,981	11,768
10 Defective Work & Errors	400	3,956	5,654	10,010	2,323	380	2,114	14,827
11 Experiments	462	550	550	1,562	550	550	825	3,487
12 Gas Consumed	20,377	16,170	27,834	64,381	25,085	16,008	29,148	134,572
13 Shop Expense Supplies	6,003	6,003	6,003	18,009	6,003	6,003	6,003	36,018
14 Taxes	1,245	1,245	1,555	4,045	1,245	1,245	1,555	8,900
15 Written off Plant	241,783	243,319	282,673	767,795	267,408	255,384	789,842	1,580,379
16 Miscellaneous Expense	129,689	129,191	162,437	421,317	131,690	139,422	160,773	853,202
17 INDIRECT EXPENSE								
18 General Mfg. Expense	41	12,816	18,371	43,817	15,860	16,697	20,819	91,273
19 Hardening	46	12,760	18,371	43,817	15,860	16,697	20,819	91,273
20 Electric Current Used	46	41,327	46,101	130,547	36,984	31,459	40,431	239,421
21 Compressed Air	50	183,278	425,850	596,761	184,534	187,578	222,023	1,189,856
22 Rent & House Service	60	427,407	509,552	1,363,556	451,942	442,912	511,865	2,770,275
23 Other Services Received		53	53	53	58	58	56	54
24 Total Indirect Expense		53	53	53	58	58	56	54
25 Total Shop Expense		65	65	65	60	60	60	60
26 % to Prod. Labor								
27 % Used								

(In the original this form reads across a single sheet, but it has been necessary to reproduce it here in two sections.—Editor).

USE OF COSTS FOR BETTER MANAGEMENT PRACTICE

C DEPARTMENT 101

	July	August	September	9 Months	October	November	December	Total Year 1926
Shop Productive Labor	689,014	808,429	972,978	9,568,979	834,919	898,595	994,695	19,237,188
DIRECT EXPENSE								
1 Salaries—Foreman	50,400	49,800	78,839	501,839	68,178	83,726	92,566	726,109
2 Salaries—Clerks & Non-Prod.	38,352	40,610	42,657	373,361	38,131	36,153	43,644	491,289
3 Vacations	41,749	41,336	19,063	107,767				107,767
4 Belting	3,217	1,614	2,538	26,029	2,713	2,373	978	32,093
5 Chgs. & Reprs. to Machinery	14,547	37,312	32,714	200,467	17,125	21,347	35,566	274,507
6 Chgs. & Reprs. to T. J. & F.	36,773	41,877	55,932	444,491	39,680	31,566	45,166	560,893
7 Depreciation on Machinery	2,733	2,733	4,509	8,468	614	1,935	1,935	11,485
8 Depreciation on Shop Fix.	55,578	55,578	58,778	488,327	60,502	61,822	61,094	671,948
9 Depreciation on T. J. & F.	4,253	4,243	4,243	35,353	4,243	4,250	4,250	48,096
10 Defective Work & Errors	1,951	1,951	2,065	17,765	2,045	2,045	2,045	23,890
11 Repairs	200	2,428	6,105	23,560	3,580	8,031	32,227	67,698
12 Gas	300	571	550	4,998	552	548	680	6,787
13 Shop Expense Supplied	14,205	21,121	19,800	189,698	20,608	20,792	15,794	246,892
14 Taxes	6,003	6,003	6,003	54,027	6,003	6,003	6,003	72,036
15 Telephone								
16 Written off Plant								
17 Miscellaneous	1,245	2,266	2,266	12,846	1,245	1,245	1,555	16,892
18 Total Direct Expense	269,123	308,452	331,032	2,488,986	265,509	260,371	343,716	3,368,582
INDIRECT EXPENSE								
19 General Mfg. Expense	123,774	145,473	163,813	1,286,262	142,734	135,111	178,773	1,742,900
20 Hardening								
21 Electric Current Used	16,818	19,907	21,074	155,072	22,804	17,380	22,959	218,165
22 Compressed Air	34,002	35,628	40,171	349,222	39,966	40,442	45,728	475,358
23 Rent & House Service								
24 Other Services Received	174,594	201,008	225,068	1,790,556	205,504	192,883	247,480	2,436,423
25 Total Indirect Expense	443,717	509,460	556,090	4,279,542	471,013	453,254	591,196	5,795,005
26 % to Prod. Labor	64	63	57	65	56	54	59	57
27 % Used	60	60	60	60	60	60	60	60

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of a wage payment system. This system was based on the unit or point method of measuring labor. Through the development of this system and its application to all parts of this plant, the control mentioned above has been attained. Of course, the start was in the production centres where ratings of the efficiency of individual operators and individual departments were the basis of control. Labor costs were obtained daily and through weekly summaries of operations, the ratings of individual departments and individual foremen were obtained.

The system has been extended until it takes in all departments, even going so far as to include the scheduler. He is rated on the percentage on standard jobs which are placed in production each week, and in addition, on the percentage of rated plant performance which is attained in the week in question.

This is virtually a standard cost system. The standards are based upon time studies through which the units have been established. Material is on a standard basis.

A brief description of the cost control analysis form which is used for each department will help explain the operation of this system. On this sheet we have the title, "Total 'Units' Produced." Under this heading are placed the actual points produced by this department during the weekly period. At the top is shown the standard performance necessary to meet the budget figure set. Under the main heading, "Division of Payroll" are the following:—"Productive," "Waste," "Non-Productive," "Total." Here are entered the actual amounts paid each week. It might help to state that "Waste" includes delays, stoppages, which are not charged to the workers but are a means of grading the foremen of the departments. The next main heading is "Cost per M Units." Under this is "Production Costs," which is the base rate paid. The next heading is "Expense," and under this are included "Excess Production," which includes overtime and the like, "Waste," "Non-Productive" and "Total Expense." These in turn are compared with standard figures set at the head of the columns. The Grand Total shows the cost per one thousand units, including the premium paid. The column at the right is the control column and shows the results. Under the heading "Cost Control Factor" is shown "Expense." The expense factor

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COST CONTROL ANALYSIS

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COST AND MANAGEMENT

is the ratio of the standard expense to that obtained by the department. The next heading is "Operator's Unit Hour;" this shows the average performance of the operator. The next column is headed "Department Unit Hour;" and shows the actual performance of the department, taking into consideration allowances and waste which are charged to the department. The last column is called "The Supervisor." In this case, it is usually the foreman, and he is rated according to departmental efficiency and the expense factor.

If a department unit hour was 68 under the unit expense factor the supervisor would be paid on the basis of 68-60, which equals 8. For any variations in the expense factor the figure 8 is divided by expense factor and the result is the amount added to the supervisor's unit hour.

Forms for all departments are grouped and ratings given to the general foremen and superintendents. They in turn are paid premium according to performance of the department or plant under their supervision. This detailed analysis of labor performance enables the supervisory officials to put their hands immediately on factors which may be interfering with the effectiveness of the plant. It brings the entire plant or plants under a common denominator and enables the executives immediately to put their fingers on poor performance or find where departments are getting away from the standard which fits into the general program of the company. The supervisory force is paid its premium from the pool which is set up. This pool is on the 75-25 basis, 25% going to the pool, 75% being the premium paid to the workers.

This company has extended the use of this control right through its entire operations. In fact, its budget sheet is made up on the basis of units. Production over a period of five years was investigated and variations noted. A budget figure was set up based on prospects and past performance. This was broken down into monthly units. The equipment of the plant was studied and the desirable components to make up the monthly quota were set down. A Profit and Loss Statement was made on the basis of the quota set up. The executive stated that in this plant the production department was telling the sales department what to do in place of the usual procedure. Sales was informed that the quota for the month was to be of certain items, and in order to operate the plant at the pre-determined schedule, it was necessary that Sales be made on the basis set.

USE OF COSTS FOR BETTER MANAGEMENT PRACTICE

Actual performance was compared with the quotas and charges to or against the Sales Department made, according to whether they attained the quota set. Analysis figures showed that this procedure had worked out fairly satisfactorily as variations from the pre-determined figures were small.

This company has attained the position where the Cost Department is working hand in hand with production. Almost immediate control of costs is secured. The cost figures as shown on the daily, weekly, and monthly summary sheets are a constant reminder to the producing department of just where they are weak and where practice may be bettered.

You may be interested to know the size of this plant. In the particular plant I have reference to there are four hundred men. One man and one girl post about forty departmental sheets a day. The workers are on a daily contract basis and summary sheets must be posted in the plant before five o'clock of the day after work is done. You can notice readily the close check which is had on production. Two girls work on Monday (this is one girl in addition to the one mentioned above) and they complete the sheets and prepare them for the Payroll Department. One additional man makes up the weekly summary sheets and during the remainder of his time works on time study. There is one other man who is working on time study at all times.

Through a series of very simple charts, a week by week picture is given to the controlling executives, of actual performance in the plant. This is an excellent illustration of the use of costs for better management practice and it bears out the much repeated statement that costs should be used hand in hand with production.

Summary

Costs should be used to control and measure the policies of management.

The executives and others concerned should be prepared so as to understand the results shown and use them for betterment.

The results should be presented in such a way that they may be readily applied. They should be supplied currently while still of value.

No figures should be taken for granted. Seek out the facts and with facts as a basis subsequent action is on the right foundation.

Labor Distribution

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(Before the Montreal Chapter, February 8th, 1924.)

THE subject of this paper carries an extremely broad title, and the thoughts of many immediately become associated with time clocks, checking sheets and numerous mechanical appliances which are used in the various methods of accumulating labor expenditure. However, in this treatment of the subject it is not proposed to more than merely mention the various methods by which the dollars and cents are recorded, and whilst in defining and explaining the different classifications of labor, it is necessary to refer to some particular method, no great digression will be made along such lines, as it is desired to impress the most important fact, that the distribution of labor should not merely be considered a classification of payroll expenditure, but should be so performed as to be without comparison the most accurate method of recording:—

- (A) Production—in all stages.
- (B) Consumption of Raw Materials.
- (C) Defective Material or Workmanship.

In the preparation of this paper the subject has been treated as applied to a manufacturing and assembling plant of considerable size with many productive departments and with more or less steady output of standard product, as it is much easier for those interested in small industries to reduce a system employed by a large organization than it is to visualize a scheme on a large scale from the presentation of the conditions in a plant where chances of variation are confined and there is little room for discussion.

Labor in the main can be divided under the following headings:—

- (a) Direct Labor.
- (b) Handling, incidental and immediately necessary to direct operations, including crane men and store men.

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- (c) Repair Labor.
- (d) Supervision and General.
- (e) Special Expenditures, including cost of making drawings, patterns, dies, etc.

Direct Labor:

Direct Labor has been defined as labor which expended on direct material increases the value of the material. In most instances, direct labor commences with the first machine operation and finishes with the last machine operation. It is best handled when controlled by piece work system, which provides for an accurate record of the production.

In construction work of many kinds, sub-foremen who are actually assisting in the physical operations are classified as direct labor, but in kindred industries Cost Accountants should agree as to whether gang leaders should, or should not, be classified as direct labor. In these days of competition when estimates are being closely examined, sometimes in detailed comparison with other quotations, it is essential that the executives should know when looking at direct labor figures that the respective totals include exactly similar operations and that one figure is not handicapped by the inclusion of an item as direct labor, which in the other is treated as an item of plant expense.

In plants where genuine piece work systems exist, there should be a system of labor distribution which would not only provide accurate records for the earnings of the individual, but also provide the foremen and the management with accurate information as to the daily output of the various units or components. If a man is paid on production, any self respecting management will provide sufficient clerical help to ensure that the man is not padding his production and obtaining earnings to which he is not entitled. It is, therefore, conceivable that sufficient checking accommodation will be granted by the management to ensure an accurate count of production.

Such figures may be obtained primarily, or perhaps only, for purposes of compiling payroll, but they can immediately be used to acquaint the foreman and superintendent with the progress of the different units of manufacture. The plant records of production, therefore, can be written up from time cards or time sheets on which the man's earnings are computed.

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Previous reference has been made to the fact that an actual consumption of raw materials can be determined from the labor distribution. It is very necessary and essential that general stores used in repairs, maintenance, and so forth, be kept under lock and key, so that a formal requisition for the quantity and description of material used is obtained whenever an issue is made. It is, however, often very inconvenient in the larger industries where enormous quantities of bulky materials, such as steel shapes, lumber, etc., are used daily, to get an accurate count by requisition of the quantity used or delivered from the yards to the shops. In many cases where requisition system is in use for bulk materials as described, the tendering of requisitions is a matter of pure formality and could be dispensed with.

It has been proven that, by concentration upon the checking of production in the shop, a genuinely accurate count of consumption of bulk materials can be obtained. The advantage of this system is that whereas in checking production for payroll, the checking is continued throughout the operations from first to last, the checking of the material is confined to the first operation on the first machine, for the reason that the second operation on any particular component cannot be performed until the first operation is completed, and therefore by concentrating on the number of units passing through the machine at the first operation, the full count is obtained. From this point and working through the shop, it is comparatively easy to obtain information as to any over-production, defective materials or defective workmanship, and to obtain redress where possible.

At such a point one is always able to check the Receiving Department as to the suitability of material, correctness of size and so forth, and if material is used from stock and not bought specifically, any undue wastage can be detected and calculated, and the additional expense correctly distributed.

Handling:

The distribution of this class of expenditure is a matter of great contention and in itself covers a very wide field of labor. The following sub-divisions can be made:—

1. Unloading and Piling.
2. Delivering to Shops.

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3. Transfers between Units and Departments.
4. Loading, Packing and Shipping.
5. Cranemen.
6. Locomotive and Switching Crews.

It is not proposed to discuss each of these items in great detail, but they are merely enumerated in order that we may picture the difference of opinion which is likely to be expressed as regards the classification of these accounts. As a matter of actual experience—

Unloading and piling has sometimes been treated as a material item and added to the prime cost of material just as would be freight, duty—and perhaps exchange.

Delivering from piles to shops has been treated as an addition to the direct fabricating labor.

Transfers of material between machines and departments have been treated as operating expense.

Loading and Shipping has been treated as direct labor.

Cranemen have been treated as either operating expense or direct labor, according to circumstances.

Locomotive and Switching crews have been charged to the job at so much per hour, separate entirely from direct labor, direct material and operating expense.

The classification of handling materials is one of very great importance, comprising as it does in many cases a very considerable expenditure and naturally varying very much according to the layout of the plant. Also with the introduction of modern machinery and equipment, expenditure in this class of work is becoming increasingly difficult to segregate. In former days when cars were put into the plant by the Railway Company and from that point were handled and moved by manual labor with the aid of rough and ready appliances, and when raw material was wheeled about the shops on trucks and hand cars, the expense was comparatively easy to compute and to control; with the expansion of business, we have the introduction of privately owned switching engines, locomotive cranes, magnets, overhead cranes and so forth, which have considerably reduced the cost of labor expenditure in handling and transferring materials, but which perhaps—taken year in and year out—

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actually do not reduce the *total cost* of handling such materials. In slack times nothing is easier than to discharge the common labor and reduce the payroll. It is not so easy, however, to dispose of the expense which is represented by switching engines, locomotive and overhead cranes, which, owing to regulations, it is necessary to man by a trained crew, paid by the day, regardless as to whether there are five cars to be moved or one hundred and five cars.

It can be readily understood that when a plant of considerable size is running at approximately fifty per cent. capacity, the treatment of handling of all kinds as an item of *operating expense* raises the percentage of the operating expense to direct labor considerably above normal, and acts to the distinct disadvantage of the Works Superintendent or Manager who may be in no way responsible for the policy of the management in tying up Capital Expenditure in the mechanical equipment utilized in handling and moving materials.

It is possibly much preferable to divide handling in the main into two sections:—

- (a) Comprising the Yard Operations of Switching, Unloading and Piling.
- (b) To cover taking the materials from piles and the handling of same between shops until shipment.

In cases where packing and shipping form a considerable item of expense—such as in food stuffs and export shipments—the matter, of course, requires entirely different treatment.

It is possible by means of time study, which requires no very great amount of work, to determine a fair charge for switching cars and also a fair charge for the cost of unloading bulk materials, such as steel, lumber, coal, coke, pig iron, etc., this cost to include a charge for the locomotive crane and the miscellaneous laborers and crane followers. This cost can be worked out at so much a car or so much per quantity, say per ton, and included in the total cost on the face of the invoice, just as would be freight charges, the application to the invoice creating a certain credit against which the actual expense in the plant can be applied. Naturally, you say that the actual expense will exceed the credit from the amount applied to the invoices, thus creating an item of expense which has to be absorbed. This is no ob-

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jection, but providing that the charges for crane service, unloading, etc., have been computed on a fair and reasonable basis, the existence of a charge in the handling Suspense Account is just what Accountants should be interested in displaying to the management. It is moreover of a special interest to the shop foremen who are responsible for production and the *direct* cost of such production, and should not be saddled with idle expense emanating from departments over which they may have supervision, but not control. It will also demonstrate to the Executive the high cost of expensive machinery and equipment, of which the initial cost is merely an indication of the expense to follow.

The suggestion is therefore that this classification of handling, namely, *switching, unloading and piling*, be kept separately, entirely apart from direct labor and operating expense and as much applied to the direct material cost as can be fairly awarded, the balance to go against earnings as an Idle Expense Account from the Yard Department.

The foregoing does not apply to miscellaneous small stores and small repair parts which are necessarily kept in bins and lockers under cover, the handling of which is an expense and is almost invariably treated as *indirect* expense. Any exception to such treatment is mainly along the lines already mentioned, and by which a certain round percentage is added to the cost of indirect materials charged into the period operations to provide a fund for Stores Expense, this charge being varied from time to time, say, from 1% to 2% as conditions warrant. This does not mean that the small individual purchase invoices will be increased by one or two per cent., which procedure would naturally render any price book or inventory record a thing of amazement rather than utility, but under this procedure invoices are entered in the usual way, and when the issues are priced, extended, totalled and distributed to the various sub-sections of the operating accounts, the totals are merely increased by one or two per cent. as the case may be, and the resulting credit used as a fund for extinguishing Stores Expense.

It should be noted that the foregoing provides a treatment for direct materials distinct from indirect materials or operating supplies. The unloading and piling of direct materials usually covers the major portion of the Yard Service and attendant day labor expenditure, and the recom-

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mendation is to entinguish such cost by the application of a set charge for each commodity as an addition to the initial cost.

General stores and supplies are usually delivered direct to the Stores in teams and the handling and storing performed by the regular storekeeping staff, possibly on a salary basis; the recommendation is to absorb this General Stores Expense by the application of a round percentage to the value of indirect materials, *when consumed*.

Handling from piles and between machines and departments is often collected separately and taken care of by application to direct labor by the exact percentage which the total of such handling bears to the total of direct labor during the period of review.

It is sometimes treated as an item of operating expense which is, of course, the simplest way out of the difficulty, but not necessarily the most correct method of distribution.

In the actual operations of any particular department, there are probably some machines which handle very heavy materials, requiring special gangs of men or special crane service. In cases of this kind, the piece work price on the machine operations, such as punching, slotting, flanging, etc., is often relatively small, and yet the attendant labor of handling and crane service is comparatively heavy—much more in fact than the piece work operation itself. On the other hand, there are other pieces of equipment handling smaller units of manufacture which the operator takes from the piles, processes, and then delivers to a convenient place for transfer to the next operation, without calling on any crane or common labor for handling. In other words, the piece work price paid is the total direct labor cost of that operation.

In reviewing such a department, therefore, if the crane service and common labor handling are included in the shop expense which in turn is distributed over the various operations or orders on the basis of direct labor, we can immediately perceive an inequity in distribution not only as regards the crane men themselves, but also as regards the upkeep of the crane, which is estimated to be at least five times the cost of the crane operator. It is, therefore, submitted that the total cost of handling labor in shops, and also crane operators and the cost of maintenance of cranes

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should be kept as a unit and distributed between the various jobs on a time basis similar to the method already outlined under unloading and switching expense, constituting a charge for the job entirely separate from operating expense. Such a proposition is never advocated without violent opposition, and one of the chief arguments advanced against it is the difficulty of obtaining an accurate division of the time spent on the different jobs, but this difficulty is not admitted to be insurmountable.

Repair Labor:

This heading requires very little explanation, as it is generally admitted that all expenditure and maintenance should be absorbed in Operating Expense divided between Departments in which the repairs are actually made. Some discussion may be useful in regard to the distribution of repairs to steam, water, air and electric lines which form part of the main plant installation and which cannot be considered as peculiar to any particular department, although when breaks occur in the various departments the costs of repairing such breaks are often charged against the cost of the particular departments instead of being accumulated separately under Power House Expense. Frequently a very expensive break will occur in the plant system and the unfairness of charging the cost of such repairs to an individual department, which may be a small one, is very evident.

In the event of repairs of this nature being accumulated under one heading and distributed between departments, a fair basis is on the total value of such equipment installed in each of the productive departments, inasmuch as a break may occur any time in any part of the system and the department with the heaviest capitalization in regard to the particular equipment involved, should bear correspondingly the greatest proportion of the expense of maintenance.

Supervision and General:

Under this heading we have the shop foremen, shop clerks, timekeepers, etc., many of whom are indisputably chargeable direct to the department in which they are employed, but in cases of general superintendents, general clerical work, general mechanical supervision and so forth, the method most easily adopted is distribution on the basis of the *average* number of men employed in each department,

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or on the average total labor expenditure in each department.

Special Expenditure—Mechanical, Die Expense, Etc.

Under this heading should be included the expense of drawing office, which in large organizations run into many thousands of dollars per annum. Much of the Mechanical Engineer's Department time is on specifications and plans for prospective business, and in making estimates for such business, much of which is not eventually booked and which therefore constitutes selling expense.

It is very often the practice to accumulate this expense as a separate item, charging the amount of time spent approximately between the different quotations with the subdivision as to drawings, etc., and to charge the time spent as a sub item against the job if eventually booked, and against the Sales Department as an item of expense if not booked. This is another Department which is responsible to the Executive and which in many cases does not come under the jurisdiction of the Works Superintendent, and to absorb such cost in operation is manifestly unfair, particularly as in many cases the shops are slackest when the mechanical engineers are busiest.

Dies, Special Tools, Special Equipment are all items which should be costed separately and kept apart from direct labor and operating expense, and if possible included in the job cost as a unit. In these days of Specialties in various lines of manufacture, the adoption of one specialty in preference to another of the same type often means wholesale changes in construction of the adjacent parts and necessitates new dies for the pressings, and such changes are extremely costly.

A number of industries do actually absorb these dies in the shop operating expense, but if the total of the operating expense, including the dies, is apportioned between different orders on the basis of direct fabricating labor, the practice is manifestly unfair.

The question then arises as to whether this class of labor—machining dies, etc.—should be treated in the shops as direct labor and permitted to carry its proportion of the operating expense of the machine shop. There is little doubt as to the superiority of such a practice, as a machine shop is very expensive to operate as regards tools, equip-

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ment and power, and whether the work done forms part of the regular construction and manufacturing programme, or for special purposes as described, each class of work should carry the same ratio of expense, and the die expense should therefore be treated as direct labor, although collected and classified distinct from fabricating or manufacturing labor.

The total expense in dies, etc., is usually carried in suspense and amortized by a charge into cost of shipments on a basis varying according to the expected production.

General Classifications:

Before touching briefly on methods of compiling distribution, it might be well to mention operations such as Finishing, Inspection and Rectifying Work, etc., which are classed either as Direct Labor or as an item of plant expense.

In the manufacture of items which are produced in any volume, the matter of inspection and testing is one which can be reduced to a piece work proposition, and under these conditions it is classed as direct labor.

In many industries, of course, the work of inspection is more in the nature of supervision, and the inspectors are paid a day wage instead of on production. In such cases, the tendency appears to classify inspection charges as indirect expense.

Inspection of materials as to quality and suitability is more in the nature of Stores Expense and is entirely different in character to inspection of production, but general recommendations are becoming more and more to the point of classifying all charges in connection with production as direct wherever possible.

It is the intention of this paper to show that charges which can be collected separately and distributed as units are kept in strict control, and there is a lessening of the danger of losing the identity and importance of these expenditures of doubtful classification, which danger exists to a greater degree when the items are included as operating expense.

In most jobs which have a number of processing stages, and where piece work predominates, there are always a certain number of operations such as inspection, rectifying

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and so forth which are paid at a day rate and which it is difficult to express in terms of production. An effort, however, should be made to classify these items as direct expenditure and to set an arbitrary job price. If the actual amount earned at the day wage is in excess of what is properly chargeable to the job at the fixed rate on the production, the balance of the amount can be classified as "excess labor" and represented as a percentage of the total piece work spent during the day.

By strictly adhering to piece work principles, production can be expressed from the amount of money expended even though no complete units are finished and shipped. For example, if the total piece work price on any job throughout the plant is \$200.00, and the amount spent is \$2,000.00, the productive wages expended represent 10 units, providing the \$2,000.00 is exactly to piece work schedule. If, however, there have been some excess wages paid and the amount actually earned on piece work basis is \$1,800.00, this represents 9 units of the production. There is, however, spent as additional productive labor \$200.00, which represents slightly more than 11% of the total piece work earnings of \$1,800.00; therefore, the plant produces the equivalent of nine units during the day, and the cost of these units represents piece work of \$200 plus 11%, or \$222.00 per unit.

It can be easily seen from this example that by carrying forward the progressive totals from day to day, the exact amount of payroll represented by the production at piece work rates, and also the excess amount of money which has been spent making up the difference between piece work rates and day rates, the exact cost of operations is a known quantity at all times, and the management is not reduced to a degree of knowledge that a certain sum of money has been spent and that the job might be considered to be $\frac{1}{2}$ complete or $\frac{3}{4}$ complete or $\frac{1}{10}$ complete—or complete to any other fraction—all of which is more or less of an estimate.

As previously explained, the features which have been presented are more in the nature for consideration in regard to machine shops and fabricating and assembling plants and no mention has been made of industries where the production is costed and sold on a composite price of so

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much per pound or per ton. In many of these, it may be claimed that no distinction is necessary as between direct and indirect expenditure in regard to handling and crane service, etc., and that the summary cost is merely a total expenditure to be divided by the total quantity of production.

This is perfectly true, but it must be remembered that the moment the Executive wish any information on any particular job cost or the moment the Accountant is bestirred to institute a class cost between the various weights or sizes of the product, inequality will immediately appear if the *general* departmental overhead costs are used on different jobs.

The practice of applying departmental operating expense is very largely confined to the ratio to direct labor, although, of course, in some departments, the expense is naturally on a tonnage basis. However, in, say, a Molding Department of the Foundry where there is bench work and floor work, the bench work is performed by the molders without any miscellaneous labor or crane service, whilst the floor work necessarily employs both.

In a Cleaning Shop, the smaller pieces are handled without the use of cranes, and the apportioning of the operating expense including crane service on the basis of direct labor, naturally will place a very heavy handicap on the smaller work which is usually much more expensive than heavy work in direct labor, on the basis of tonnage cost.

On the whole, it appears that if at all possible, the cost of crane service and handling should be kept as a unit cost and distributed over the tonnage handled on as equitable a basis as observance permits.

Methods:

In regard to the actual physical distribution of labor, it is necessary that the time card or sheet be large enough to permit of an accurate distribution of the work performed, together with its quantity of production, where any.

It is the almost universal practice to designate the classification of labor by a particular *symbol*; the department by a *code number*, and the various divisions of labor, as between repairs to different types of equipment, super-

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vision, etc., by a *code sub-number*, in order to permit of ready tabulation.

On direct work, the various components or parts are also designated by code numbers or mark numbers, and the various operations on each part by further sub-numbers, the series of numbers being naturally distinct from that assigned to Operating Expense.

As indicated earlier in this paper, under the discussion of Direct Labor, postings from the time sheets can be made to the daily summaries of production, and in many instances these postings are checked by a summary from the time cards, performed either by hand or by use of the Hollerith Machines.

One of the main requirements in a shop record, and particularly in the production record referred to, is that in addition to the quantity of production, the totals of labor expenditure should also be posted and the totals carried forward from day to day in order that the total expenditure on any operation can be checked against the production at any time. In many cases industrial firms concentrate on the shop production records and obtain such accurate figures at that point in regard to the division of expenditure between operations, that no further sub-division of the expenditure is made at headquarters or in the main time office, the checking of the total dollars and cents against each job in gross being considered adequate.

It is not intended to provoke any discussion in this paper as to the relative merits of compiling payroll by hand or by machine, but it is advisable to point out that the Cost Accountant is responsible for supplying the superintendent and the management with not only the cost of direct operations in labor and material, but also the cost of the Indirect Labor. Great pains are taken to ensure accurate record of production and direct labor earnings, and great efforts should also be made to provide enlightening information as to the indirect labor expenditure, much of which is not subject to the same close check and comparison to which direct labor is subject.

In many departments and plants, the executives elaborate their system of budgetary control to cover the number of men, and the consequent expenditure of indirect labor in each department, and on the first of each week or month

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lay down a schedule showing the maximum number of each class of indirect help which will be allowed each day during the period—variable according to plant conditions.

In plants where the control of the timekeeping is under the Accounting Department, the Accountant should see that the Works' Superintendent is supplied with the number of each class of indirect labor employed each day not later than ten o'clock of the morning of the same day, and *not* the day following. This is a very easy matter if dial time clocks are in use and the men's check numbers are arranged in classification according to occupation. The information can be obtained from the boards if individual card clock system is in vogue, and the brass check system presents no great difficulty, providing that the check numbers are arranged as outlined.

By noon of the day following, all production records should be entered up and totals carried forward and the departmental and summary totals of the payroll submitted, divided between Direct and Indirect Expenditure.

The foregoing remarks are presented with the idea of impressing upon all concerned the necessity for a deeper conception of the term "Labor Distribution" than the mechanical division of the total expenditure into sub-divisions for the purpose of record. Too often these records are regarded and treated merely as statistical rather than vital information.

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TORONTO

Through the courtesy of our popular and energetic member, G. E. Carruthers, some forty members of Toronto Chapter visited the plant of Durant Motors of Canada, Ltd., at Leaside, on April 27. After luncheon in the company's dining-room, General Manager Roy D. Kerby outlined the general policy carried out and stated the company's ideal for a high quality Canadian product in the Star car. Then Mr. Carruthers and other officers of the company conducted the visitors through the works, and explained the different operations. In the main plant the chassis is assembled on the ground floor, while upstairs the bodies are put together; then each body is fastened to a pulley and lowered through an opening in the floor, placed upon a chassis, and the car goes to the finishing department. Although the engine (the well known Continental) is imported, and many other completed parts are used, the visitors were impressed with the extent of the work done, the number and variety of operations, and the general efficiency of the plant.

MONTREAL

A valiant attempt will be made to disregard the superlatives which are crowding the writer's mind in reporting the Fourth Annual Dinner of the Montreal Chapter. It might be as well to recount a few of the difficulties in arranging a "not too heavy" but interesting programme for an event of this kind. We first of all assume responsibility for the meal itself. Now, if there is anything more difficult than having to decide that a certain menu is going to please over a hundred people, without the assistance of a known number of gastronomic connoisseurs, it has yet to be discovered. Along with this is the "guarantee" that hotels have a habit of asking for. This is legitimate of course, but it keeps one on an anxious seat. Not desiring to refuse

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probable attendance the usual thing is to over-estimate, this condition is expensive should the guarantee not be "made." The object of writing this is to place before the members the chief difficulties experienced by Chapter Officers in arranging a Dinner of this kind.

Next, there are the Speakers and their subjects. It is obvious that unknown speakers and uninteresting subjects would quickly dampen any enthusiasm. It is not always possible to obtain just what we would like far enough in advance to notify all members by mail. Great men do not all keep diaries, rather press clippings, and, while some, in all good faith, promise to attend a gathering of this kind, they do not arrive. Quite possibly a subsequent request or invitation is more urgent than a previous promise.

We next have to supply entertainment. The music of cutlery and dishes, while harmonious at the hunger stage, becomes discordant when the pangs have become even slightly subdued, we then seek a replacement more in keeping with the spirit and feeling of the affair. Strange as it may seem, musicians and singers have to be paid, and the greater the attendance, the more pleased is everybody concerned, it makes it easier financially. It is sincerely hoped that the editor will let the foregoing stand, and now follows the report of the meeting.

It was our pleasure to listen to Professor R. M. Sugars, Director of the School of Commerce, McGill University. The Development of Commerce was the topic upon which Professor Sugars spoke. Many historical examples of Commerce were given, and an interesting outline related to the audience. We were reminded of how, in the old days, a "gentleman" did not enter commerce, and how it was always thought that a living could be made by buying something and merely selling it. Since those days Commerce has changed. Professor Sugars proved it to be the basis of the present civilization and if disrupted or paralyzed for any reason, catastrophe would result, the glories of art, science and learning would disappear. "Furthermore," he remarked, "Commerce has in its evolution, created evils of social and economic nature which require wise and delicate handling to avert the probable catastrophe." Present day instances were referred to, of people living on the industry of others, being maintained in idleness at the expense of the commun-

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ity in general, in other cases, by receiving more than a fair exchange for their industry. It is hoped that the universities and the business world will draw even closer together and promote the existing intuitive desire to do away with the modern evils of commerce. Professor Sugars' address was well received and the appreciation of the audience was "loud and long."

Before proceeding farther you should be told something of the Chairman's address. A review of the work accomplished by the Chapter was given by Lorenzo Belanger, who in a very forceful manner, outlined the necessity for this Society in business life. As it was later remarked, Lorenzo is something of a philosopher and proved without doubt the benefits to be derived through association of kindred professions and the free and open discussion of problems. The Chairman's address, it is hoped, will appear in the magazine.

Dr. J. P. Day, Professor of Economics, in his address suggested Central Control for the Bank Rate in Canada, pointing out that we appear to be the only country without such control of credit. Dr. Day pointed out just how vague the credit situation in Canada was, questioning whether by responsibility of Banks to their Shareholders alone was sufficient for the proper development of credit, or whether the Finance Minister had the power to exercise such control when needed. Whether or not the Banks in Canada "get together" on this question, and if so, who was the authority. This was a very keen address and will be reported fully later.

We had B. K. Sandwell, F.R.S.C., with us on this memorable occasion. Mr. Sandwell, as he himself says, decided for financial reasons to forsake the classics for financial journalism, and, as he is always kind enough to give us a few "lines," am pleased to inform readers that he is the Editor of the Financial Times. "Who's Who in America," was his topic for a few minutes. He proves that Canada is doing well in the U.S.A., and he doesn't like it. American businesses are scouting in our Universities for the promising student to give him a job. He pointedly remarks "Why can't we absorb the young brains of our country ourselves" and the "balance of trade in brains is not disclosed in the statistics of imports and exports." Another remark of the evening "the chief exports of Scotland are Whisky and Accountants not always consigned separately."

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The Presidents of the Chambre de Commerce, (who spoke in French and English) and the Board of Trade were guests of the Chapter, as well as Officers of the Bank of Montreal, Canadienne Nationale, Royal and Banque Provinciale.

The Chairman for the coming session, R. R. Thompson, M.C., C.A., Professor of Accounting, McGill University, was inducted into office and took over the duties of office at that time.

During the evening excellent entertainment was given by the Queen's Hotel Orchestra, directed by Mr. Markowski, the Sylva Quartette and Miss J. J. Johnston. While these artistes were resting an element of musical surprise was rendered by the latest development of the Victor Talking Machine Company. Several selections were rendered on the Automatic Orthophonic by remote control. The changing of selections, starting and stopping being accomplished by the operation of an electric switch by the Chairman of the meeting. Accustomed as must of us are to present day mechanical marvels, the duplication of human movements by this machine is intriguing to say the least, the usual noises incident to a gathering of this size were easily overcome by the pure volume of this instrument.

In closing the Chapter desires to record its appreciation to the retiring and incoming Chairman, Professor R. M. Sugars, Dr. J. P. Day, the Artistes, the Victor Company, and, last but not least, the Queen's Hotel Management.

HAMILTON

The annual dinner of Hamilton Chapter has been arranged for Thursday evening, May 19, and a good turnout of the Hamilton members is expected, while a number of Toronto members have arranged to attend. This meeting will be reported in our June issue.

The Canadian Society of Cost Accountants

APPLICATION FOR MEMBERSHIP

Name in full Age

Address in full

Firm with whom engaged

Firm's address in full

Firm's Business Position held

Names and addresses of two references:

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(If applicant is a Member of any Accounting Institute or Society incorporated under the authority of any Provincial Legislature, it will be sufficient to give the name and address of the Secretary of such Institute or Society.)

To R. S. Smith, Hon. Secy., 77 Commissioner Street, Toronto.

I hereby apply to be admitted a Member of The Canadian Society of Cost Accountants and undertake if admitted to observe all the By-laws and Regulations of the Society for the time being in force.

I enclose herewith Dollars, being my Membership fee to the end of the current half year, which is to be returned to me if this application is not accepted. year

SIGNATURE OF APPLICANT

DATE

